

REMARKS/ARGUMENTS

Reexamination and favorable reconsideration in light of the following comments is respectfully requested.

Claims 1-24 are currently pending in the application. Of these claims, claims 1-15 and 17-24 stand rejected and claim 16 stands allowed.

In the Office action mailed August 11, 2003, claims 1, 2, 4-14 and 17-24 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,388,959 to Forrester et al. in view of U.S. Patent No. 6,475,253 to Culler et al. Further, claims 3 and 15 were rejected under 35 U.S.C. 103(a) as being unpatentable over Forrester et al. in view of Culler et al. and further in view of U.S. Patent No. 3,834,001 to Carroll et al.

The foregoing rejections are traversed by the present response.

The present invention relates to an air seal for use in a gas turbine engine having improved durability. The air seal comprises a seal substrate and an abradable seal layer on the seal substrate. The abradable seal layer is composed of a densified polyimide foam.

To establish obviousness, the Examiner must do more than identify the elements in the prior art. There must also be some objective teaching in the prior art or knowledge generally available to one of ordinary skill in the art which would lead an individual to combine the relevant teachings of two cited references. See *In re Fine*, 5 USPQ 2d 1596, 1598 (Fed. Cir. 1988). The motivation, suggestion or teaching may come explicitly from statements in the prior art, the knowledge of one of ordinary skill in the art, or in some cases the nature of the problem to be solved. See *In re Kotzab*, 55 USPQ 2d 1313, 1317 (Fed. Cir. 2000). It is submitted that

when one reviews the obviousness rejections in the current application, one will find that the required motivation, suggestion or teaching is missing.

With regard to the rejection of claims 1, 2, 4-14, and 17-24 over the combination of Forrester et al. in view of Culler et al., there is no question that Forrester et al. does not teach or suggest an abradable seal layer composed of a densified polyimide foam. Thus, in order to have a valid obviousness rejection, the secondary reference to Culler et al. must contain the required motivation, suggestion or teaching to form an abradable seal layer to be used in a gas turbine engine from a densified polyimide foam. A review of Culler et al. shows that it contains no suggestion or motivation. This is confirmed by the inability of the Examiner to point to a single portion of Culler et al. where the required suggestion or motivation can be found. Culler et al. is directed to the manufacture of a completely different product which has no utility in gas turbine engines – namely, a coated, bonded or non-woven abrasive article containing precisely shaped particles and a binder. With regard to the portion of Culler et al. beginning at column 19, line 60 et seq., Culler et al. are talking about various backings suitable for preparing coated abrasive articles. The backings include polymeric film, primed polymeric film, cloth, paper, vulcanized fibres, polymeric foam, nonwovens, treated versions thereof, and combinations thereof. Examples of polymeric films include polyester film, polyolefin films, polyamide films, polyimide films, and the like. There is absolutely nothing in this portion of Culler et al. which would lead one of ordinary skill in the art to form an abradable seal layer from a densified polyimide foam. In other words, there is nothing which would teach one of ordinary skill in the art to select this particular material from the list of available materials. Since Culler et al. is directed to a completely different problem, namely, the formation of an abrasive article, such as a grinding wheel having grit particles, there is nothing in the patent which would say to one of

ordinary skill in the art that if you are forming an abradable seal layer to fit into a gas turbine engine that it could advantageously be formed from a densified polyimide foam. This is the point which the Examiner misses in his comments in the latest Office action.

With respect to claims 4-6 and 19-21, these claims are allowable because Culler et al. do not teach or suggest how to make a polyimide foam having the claimed densities. Claims 7 and 22 are allowable because Culler et al. does not teach or suggest how to make a polyimide foam having the claimed shear strength. Claims 8-10 and 17 are allowable because the cited and applied references do not teach or suggest the claimed combination of elements, particularly the knife edge seal of claim 10.

Claims 11 and 18 are allowable because Culler et al. do not teach or suggest the use of a thermomechanically densified polyimide foam as an abradable seal layer.

Claim 12 is allowable for the same reasons as claim 1 and further because Forrester et al. does not teach or suggest an abradable seal material applied to a bond layer. The abradable seal material in Forrester et al. is bonded directly to the substrate (see the Abstract in Forrester et al.). Element 22 in Forrester et al. is an abrasive seal structure.

Claim 13 is allowable because neither of the references teaches applying the seal between a stator box and a disk.

Claim 14 is allowable for the same reasons as claim 12.

Claims 23 and 24 are allowable because neither of the cited references teaches or suggests forming a bond layer from at least one adhesive material layer or at least one adhesive strip.

With respect to the Examiner's response to Applicants' arguments, the citation of the *Masham* case is duly noted; however, the Examiner misses the thrust of the argument. The

argument again is that there is nothing in Culler et al. which would teach or suggest using the claimed densified polyimide foam as an abradable seal layer in a gas turbine engine. There is a long laundry list of materials which can be used in an abrasive situation, albeit one for manufacturing a grinding wheel. There is nothing in Culler et al. (and again the Examiner has not pointed to anything in Culler et al.) which would motivate or suggest to one of ordinary skill in the art that he or she should select a densified polyimide foam material for use as an abradable seal layer in a gas turbine engine. The fact that a particular material may exist is insufficient to establish obviousness as pointed out by the Fine case. There must be something more - namely, the teaching or motivation. This is what is missing from the secondary reference and this is why the obviousness rejection fails. Further, it should be duly noted that the Examiner's beliefs are not the standard of determining obviousness. The issue of obviousness is strictly determined from the teachings of the references.

With regard to the rejection of claims 3 and 15, the Carroll et al. reference does not overcome the deficiencies of the Forrester et al. and Culler et al. references. Thus, these claims are allowable for the same reasons as their parent claims as well as because none of the cited and applied references, alone or in combination, teaches or suggests the claimed combination of elements.

For the foregoing reasons, the instant application is believed to be in condition for allowance. Such allowance is respectfully solicited.

A Notice of Appeal is appended hereto in the event that the Examiner maintains the rejections of record.

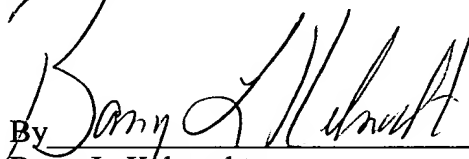
Should the Examiner believe an additional amendment is needed to place the case in condition for allowance, he is invited to contact Applicants' attorney at the telephone number listed below.

The Commissioner is hereby authorized to charge the Notice of Appeal fee in the amount of \$330.00 to Deposit Account No. 21-0279.

Should the Commissioner determine that an additional fee is due, he is hereby authorized to charge said fee to said deposit account.

Respectfully submitted,

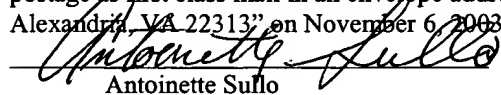
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I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: "Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313" on November 6, 2003


Antoinette Sullo